FORM PTO-1390 (REV 10-94) | U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE | ATTORNEY'S DOCKET NUMBER: 12875.10USWO

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

U S APPLICATION NO (If known, see 37 C F R 1.5): CONCURRENTHEREWITH 09/485097

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/DK98/00342	6 August 1998 ~~8 August 1998~~	6 August 97 ~~8 August 1997~~

TITLE OF INVENTION

METHOD OF MANUFACTURING A COMPOSITE MATERIAL

APPLICANT(S) FOR DO/EO/US

Benny Martin MATHIESEN

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [X] This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(l).
4. [ ] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [X] is transmitted herewith (required only if not transmitted by the International Bureau).
   b. [X] has been transmitted by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US)
6. [ ] A translation of the International Application into English (35 U.S.C. 371(c)(2)).

7. [X] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] have been transmitted by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [X] have not been made and will not be made.

8. [ ] A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).

9. [X] An unsigned oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).

10. [ ] A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. [ ] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.

12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.

13. [X] A FIRST preliminary amendment.
    [ ] A SECOND of SUBSEQUENT preliminary amendment.

14. [ ] A substitute specification.

15. [ ] A change of power of attorney and/or address letter.

16. [X] Other items or information: International Preliminary Examination Report; Application as amended under Article 14; International Search Report; courtesy copy of PCT/DK98/00342; abstract; 1 sheet of formal drawings

U.S. APPLICATION NO (If known, see 37 C F R 1 5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
CONCURRENT HEREWITH 09/485097	PCT/DK98/00342	12875.10USWO

17. [X] The following fees are submitted:

CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492(a) (1)–(5)): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **$970.00**	
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$840.00**	
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO **$760.00**	
International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)–(4) **$670.00**	
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)–(4) **$96.00**	
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 970.00
Surcharge of **$130.00** for furnishing the oath or declaration later than [X] 20 [ ]30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$ 0.00

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	13 −20 =	0	X **$18.00**	$ 0.00
Independent claims	2 −3 =	0	X **$78.00**	$ 0.00
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$260.00**	$ 0.00
TOTAL OF ABOVE CALCULATIONS =				$ 970.00
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).				$ 0.00
SUBTOTAL =				$ 970.00
Processing fee of **$130.00** for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$ 0.00
TOTAL NATIONAL FEE =				$ 970.00
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40.00 per property +				$ 0.00
TOTAL FEES ENCLOSED =				$ 970.00
			Amount to be: refunded	**$0.00**
			charged	**$0.00**

a. [X] Check(s) in the amount of $970.00 to cover the above fees is enclosed.

b. [ ] Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 13–2725.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO
John J. Gresens
MERCHANT & GOULD P.C.
3100 Norwest Center
90 South Seventh Street
Minneapolis, MN 55403

SIGNATURE

John J. Gresens
NAME

33,112
REGISTRATION NUMBER

INSTRUCTIONS

SMALL BUSINESS

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) AND 1.27(c)) - SMALL BUSINESS CONCERN

I hereby declare that I am

Check one ➤ a) ( ) the owner of the small business concern identified below:

b) ( ) an official of the small business concern empowered to act on behalf of the concern identified below:

Insert company name and address ➤ NAME OF CONCERN: KE-Burgmann A/S

ADDRESS OF CONCERN: Park Allé 34
6600 Vejen, Denmark

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.12, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

Insert title of application, inventor's names ➤ I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled Method of manufacturing a composite material by inventor(s) Benny Martin Mathiesen
Gl. Strandvej 1, 5500 Middelfart, Denmark described in

Check one, fill in if b) or c) ➤ a) (X) the specification filed herewith.

b) ( ) application serial no. _____, filed _____.

c) ( ) patent no. _____, issued _____.

If the rights held by the above-identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who could not qualify as an independent inventor under 37 CFR 1.9(c), if that person had made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e). *NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

Insert co-owners, if any, and check a), b) or c) ➤ NAME _____

ADDRESS _____

a) ( ) INDIVIDUAL b) ( ) SMALL BUSINESS CONCERN c) ( ) NONPROFIT ORGANIZATION

NAME _____

ADDRESS _____

a) ( ) INDIVIDUAL b) ( ) SMALL BUSINESS CONCERN c) ( ) NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereof, or any patent to which this verified statement is directed.

Insert ➤ NAME Finn Jacobsen

TITLE Managing director

ADDRESS Park Allé 34, 6600 Vejen, Denmark

Sign, date ➤ SIGNATURE Jacobsen DATE 27/1-2000

V940919

S/N unknown

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Mathiesen	Docket No.:	12875.10USWO
Serial No.:	unknown	Filed:	concurrent herewith
Int'l Appln No.:	PCT/DK98/00342	Int'l Filing Date:	8 August 1998
Title:	METHOD OF MANUFACTURING A COMPOSITE MATERIAL		

CERTIFICATE UNDER 37 CFR 1.10
'Express Mail' mailing label number:
Date of Deposit: 3 February 2000
I hereby certify that this correspondence is being deposited with the United States Postal Service 'Express Mail Post Office To Addressee' service under 37 CFR 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington, D.C . 20231.

By: Linda McCormick
Name: Linda McCormick

PRELIMINARY AMENDMENT

Box PCT
Assistant Commissioner for Patents
Washington, D. C. 20231

Dear Sir:

In connection with the above-identified application filed herewith, please enter the following preliminary amendment. Please examine the specification and claims as amended under Article 14, 8 August 1999.

IN THE ABSTRACT

Insert the attached Abstract page into the application as the last page thereof.

IN THE SPECIFICATION

A courtesy copy of the present specification is enclosed herewith. However, the World Intellectual Property Office (WIPO) copy should be relied upon if it is already in the U.S. Patent Office.

IN THE CLAIMS

In claim 3, line 1, replace "claim 1 or 2" with --claim 1--.

In claim 4, line 1, replace "claims 1-3" with --claim 1--.

In claim 5, line 1, replace "claims 1-4" with --claim 1--.

In claim 6, line 1, replace "claims 1-5" with --claim 1--.

In claim 7, line 1, replace "claims 1-5" with --claim 1--.

In claim 8, line 1, replace "claims 1-7" with --claim 1--.

In claim 9, lines 1 and 2, replace "the claims 1-8" with --claim 1--.

REMARKS

The above preliminary amendment is made to remove multiple dependencies from claims 3,4,5,6,7,8 and 9.

A new abstract page is supplied to conform to that appearing on the publication page of the WIPO application, but the new Abstract is typed on a separate page as required by U.S. practice.

Applicants respectfully request that the preliminary amendment described herein be entered into the record prior to calculation of the filing fee and prior to examination and consideration of the above-identified application.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicants' primary attorney-of record, John J. Gresens (Reg. No. 33,112), at (612) 371-5265.

Respectfully submitted,

MERCHANT & GOULD P.C.
3100 Norwest Center
90 South Seventh Street
Minneapolis, Minnesota 55402
(612) 332-5300

Dated: 3 February 2000

By _____
John J. Gresens
Reg. No. 33,112

JJG/klj

Method of manufacture of a composite material

Background art

The invention relates to a method of manufacture of a composite material according to the introductory part of claim 1, a composite product according to the introductory part of claim 9 and an apparatus for performing the method according to the introductory part of claim 11.

Composite products comprising a reinforcing woven material and a polytetrafluorethylene (PTFE) foil are used for many different industrial purposes. Within the chemical industry, this kind of material is for example used for vessels, compensators, containers, conveyor belts and chemical barriers in general that must be able to resist strong chemical and thermal impacts. This is likewise the case within power plants, the food industry and many other applications where reliable and strong mechanical and/or chemical properties are also important.

In a composite material of the above kind the interaction between materials in the composite will create the properties that makes the composite material suitable for a given application. Typically, the woven material will improve the mechanical properties during a thermal impact whilst the applied PTFE foil or foils will constitute barrier properties that can be maintained even under high temperatures.

However, it has proven difficult to obtain a proper "balance" between the individual components of the composite material during its manufacture. This is

because a composite product typically shrinks relatively much during the manufacturing, so that the final end composite product displays significantly different dimensions than those of the original laminated product. This is in particular a problem in relation to the manufacture of composite products with pre-determined end dimensions, just as there is a tendency for the composite product to bend or wrinkle particularly in the edge regions.

Apart from the problem in itself that the composite shrinks or in other ways are disfigured, it is also a problem that it can be difficult to predict which dimensions the end product actually obtains. This results often in that the composite product, where it is possible, must be machined further after the lamination. This further treatment such as machining results in material waste just as it most often is not possible to carry out the further treatment of a product in an automated manner.

Furthermore, it must be mentioned that the material waste as a result of the shrinkage of the material in itself is so high that it is a significant factor in the final production price. An laminated assembly to composite product of the above kind can shrink with more than 10 %.

A way of improving the manufacturing process is by adding to the woven material an extra layer of coating on the opposite side of the provided lamination of PTFE foils.

This solution however makes the manufacturing process more expensive in itself, results in an increased use of

material, and finally results in that the finished composite materials are increased in thickness and weight.

Other processes for manufacturing composite products by laminating are known from e.g. WO-A-92/09429, EP-A-0 711 657, EP-A-0 159 942 and GB-A-1 451 824.

Disclosure for the invention

By, as disclosed in claim 1, to cool the composite material subsequently in a fully or partly fixed state, a composite material with an improved form stability, reduced shrinkage and an enhanced elastic modulus (E-module) is obtained.

By reducing the shrinkage for the PTFE of the composite, a better form stability for the product as a whole is hereby obtained, since the woven material typically is very sensitive to shrinkage by lamination with a foil.

The main purpose, that is to obtain an improved form stability, is thus a very important factor in connection to a precision produce of composite products, conduit linings, compensators, conveyor belts, tank liners, containers or similar applications, where a poor form stability results in that the finished product shrinks with a relative large and not fully determined percentage.

This is also the case where the composite materials, in for instance chemical plants, is combined with form stabile components with known dimensions, since it can be

tremendously difficult to predict the dimensions of the finished composite product.

A fixation of the composite could as an example be carried out by expanding the composite in a frame, and then carry out a cooling by the use of a gas or a liquid.

By the invention it is preferred to let the cooling take place as quickly as possible after the heating.

By a reinforcing woven material is understood for instance glass fibre fabric, PTFE fabric, PTFE coated glass fibre fabric or other materials. However it is preferred in many applications to use glass fibre fabric. By a ePTFE foil is meant an expanded PTFE foil.

According to the invention, by fixation in full or partly of the composite during the cooling, it is further possible to regulate or control the shrinkage of the finished product. This is of major importance in relation to products where high dimensional requirements are requested of the end product. A part of the cooling process can for instance be carried out in a fixed state, whilst another part of the cooling process can be carried out in a non-fixed state.

It is understood that the invention can be carried out as a sub-process of a total process, since it is possible to manufacture a composite material with one added layer of foil and fabric at the time, so that a multi-layered composite material can be manufactured by laminating one layer to the composite at the time.

Article 34 Amd IC

Besides there is achieved the significant advantage that the finished composite material according to the invention in itself exhibits a significantly reduced shrinkage of the end product relative to the added foils and fabrics, which means that the utilisation degree can be enhanced by at least 10 %.

Moreover, a major trimming of the edge regions can be avoided, whereby the waste of material in this relation is reduced.

By, as described in claim 2, to let the cooling be carried out over a period of time of approximately 0.1 to 240 seconds from a temperature of 300 to 420 °C to a temperature of about 50 °C, an advantageous and practical embodiment of the invention is achieved.

It is preferred for many of the used material thickness that the time period is approximately 20 to 120 seconds from a temperature of 380 to 400 °C to a temperature of about 50 °C.

It is understood that the time and cooling process is very dependent on the thickness and the properties of the individual components.

It should be emphasised that the cooling can be done rather quickly, whereby the combined cooling and fixation is vary attractive in connection with automatic and continuous manufacturing processes.

It is further understood that improved results can be achieved by performing a cooling according to the

Article 34 Amd't

invention over a part of a temperature interval, just as it is understood that the best result, however, first will be achieved when cooling over the whole temperature interval, i.e. from a given high temperature to a wanted end temperature.

By, as described in claim 3, to let the composite material be subject to a tension during the cooling, an advantageous embodiment of the invention is achieved.

By, as described in claim 4, that the composite material undergoes a combined cooling and pressure operation by means for pressure application, an advantageous embodiment of the invention is achieved, since the means for pressure supply fixates the composite material during the cooling, which results in a solid improvement of the form stability. Specifically, a particularly high E-module can be achieved for the final composite product, just as a good form stability is achievable. This means for instance that the shrinkage of a composite material manufactured according to the invention will be significantly reduced. By certain types of products the shrinkage can be reduced with a factor 10-15 and the E-module can be enhanced by a factor 5.

The achieved fixation by means for pressure supply also means that the composite can be cooled during a very high pressure, as the composite hereby is fixated in a controlled manner during the entire cooling. This high cooling pressure results firstly in that the form of the composite is maintained during the cooling in its final shape, and secondly that the cooling takes place much more quickly across the surface. An improved contact

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between the means for pressure supply and the composite thus leads to an improved mutual heat transport, whereby the cooling of the composite can be accelerated.

By, as described in claim 5, that the means for pressure supply is provided with cooling means, a particularly advantageous embodiment of the invention is achieved, since it has been discovered that this combined cooling and pressure application results in an optimal result with respect to the produced composite materials. Firstly, a product with improved shrinkage properties is achieved, secondly, the product can be produced with a relative uncomplicated control.

As mentioned above, an improved contact between the means for pressure supply and the composite thus results in an improved mutual heat transfer whereby the cooling of the composite can be accelerated.

By, as described in claim 6, that the pressure supply is provided continuously by means for pressure supply comprising at least one roller, there is established a commercially advantageous possibility of providing a continuous production of a form stabile composite material and/or a high E-module.

The production can further be carried out in a relative high speed.

By, as described in claim 7, that the pressure supply is provided intermittently by means for pressure supply comprising a pressure surface, there is achieved a particular advantageous embodiment of the invention, as

AMENDED SHEET

the pressure supply applied by a pressure plate can be completely controlled in the sense that any supplementary tension in the foils or the surface direction of the composite in many applications can be totally avoided.

The pressure supply can be provided by controlling only one parameter, i.e. the pressure provided by the means for pressure supply. By using this pressure surface it is avoided that the diffusion properties are influenced uncontrollably by simultaneous tension in the foils or the composite.

As a pressure surface is in this connection for instance understood a plate, just as a pressure surface can be in the shape of a form.

It is preferred according to the invention to use a relative high surface pressure, since the fixation thereby becomes better during the cooling. As an example a pressure of 0.1 - 20 N/mm^2 can be used.

A high surface pressure on the composite material during the cooling will result in improved material properties both with respect to the form stability and performance, just as shrinkage in the flow direction in the continuous process is reduced, as the composite due to the use of a pressure plate also is held in its longitudinal direction during the cooling.

By, as described in claim 8, that the composite material is cooled under a substantively uniform pressure over the surface by a cooling surface, a possibility is achieved

to obtain a composite material having uniform shrinkage properties over the entire surface.

By, as described in claim 9, that the product comprises at least one foil layer of PTFE or ePTFE foil and at least one layer of reinforcing woven material, a product is achieved possessing a high E-module and other advantageous material properties.

A further advantage by a composite product of the above mentioned kind is that the edge properties become improved considerably, as a reduced shrinkage of in particular materials that consist of for instance a layer of PTFE foil laminated without the use of the teaching according to the invention would have a tendency to curl or "wrinkle" in the edges of the composite product. This disadvantage is partly equalised by the improvement of the shrinkage properties, that is less shrinkage, just as the fixation of the composite during the cooling improves the resulting form stability overall in the product - and thereby also in the edge sections.

By, as described in claim 10, that the reinforcing woven material consists at least partly of glass fibre fabric or PTFE coated glass fibre fabric, a particular advantageous embodiment of the invention is achieved. The invention has proven itself particular advantageous with respect to the relative high sensibility compared with a laminated PTFE foil. It has proven possible to produce composite products, e.g. discrete components, endless webs of the composite etc., without that the dimensions of the final products divert substantively from the original form of the composite in its non-final state.

Under all circumstances it is possible according to the invention to obtain a larger degree of predictability with respect to the shrinkage.

The drawings

In the following, the invention is further described under reference to the drawings, where

fig. 1 shows a preferred embodiment of the invention, and where

fig. 2 shows a further embodiment of the invention.

Preferred embodiment

In figure 1 a schematic view is shown of a preferred automated embodiment according to the invention.

In the viewed embodiment, the shown apparatus is fed by endless webs of PTFE foil 1 and PTFE coated glass fibre fabric 2 from a roll of PTFE foil 3 and a roll of PTFE coated glass fibre fabric 4. The finished composite 9 is wound up on a roll 10.

According to the viewed embodiment the webs 1 and 2 perform a relative movement relative to the apparatus and the rollers 3, 4 and 10 are rotated by not shown forwarding means in an intermittent movement in between two co-operating heated pressure surfaces 5 and 6. These pressure surfaces 5, 6 are in the shown embodiment connected to not shown hydraulic pressure- and movement means and adapted to perform a relative movement to and from the two webs 1 and 2.

The above stepwise movement in the longitudinal direction essentially corresponds to the pressure surfaces 5, 6.

When the stepwise movement has fed two new partial lengths of foil 1 and glass fabric 2 in between the pressure surfaces 5, 6, the pressure plates 5, 6 will move against the webs and perform a combined pressure and heat treatment so that the foil 1 and the glass fabric is joined together in a lamination.

According to the viewed embodiment, the foil and the glass fabric is heated to a temperature of approx. 380°C - 400°C under a pressure of 0.1-20 N/mm^2.

When the lamination is completed the pressure surfaces 5, 6 are moved away from each other and the now laminated composite is moved in an intermittent movement in between two co-operating cooling means.

The cooling means will over a time period of 20 - 120 seconds cool the composite to a temperature of about 50°C and applying a pressure of 0.1 - 20 N/mm^2.

When the lamination of the partial length is completed the pressure surfaces are moved apart and the composite web is rolled up on a roll.

It is understood that the above described process is a continuous process where a cooling of a partial length is carried out simultaneous with the heating of the preceding partial length.

It is moreover understood that the different process parameters can be adjusted and optimised to the properties and thickness of the chosen materials.

It is thus within the scope of the invention to vary the temperature and the time intervals with respect to the applied materials and the wanted result.

It is likewise understood that the composite also could be applied a multiple of lamination and glass fibre fabric layers until the wanted thickness and the wanted material properties are achieved.

In fig. 2 a further embodiment of the invention is shown.

In the shown embodiment the apparatus is fed by endless webs of PTFE foil 1 and a PTFE coated glass fibre fabric 2 from a roll of PTFE foil 3 and a roll of PTFE coated glass fibre fabric 4. The finished composite 9 is wound up on a roll 10.

According to the shown embodiment the webs 1 and 2 perform a relative movement relative to the apparatus and the rollers 3, 4 and 10, that are rotated by means of not shown forwarding means in a continuous movement in between two co-operating heated pressure surfaces in the shape of rollers 15 and 16. These rollers 15, 16 are in the viewed embodiment connected to not shown pressure means.

When the continuous movement has fed the two new partial lengths of the foil 1 and the glass fabric 2 in between the pressure rollers 15, 16, the pressure rollers are

moved relative to the webs and apply a combined pressure and heat impact so that the foil 1 and the glass fibre fabric are joint together in a lamination in a continuous movement.

When the relevant part of webs have been moved away of the rollers they are laminated and are forwarded in between two co-operating pressure surfaces 17, 18 that are provided with cooling means.

The cooling means will over a time period of e.g. 0.1 seconds cool the composite to a temperature of about 50°C whilst under pressure.

The composite is finally wound up on the roll 10.

It is understood that many different types of apparatuses can be designed for the performance of the invention.

As an example thereof, it can be mentioned, that the corresponding pressure surface arrangement displayed in dotted lines could be omitted.

PATENT CLAIMS:

1. A method of manufacture of a composite product comprising at least one layer of reinforced woven material and at least one layer of PTFE foil or ePTFE foil, where the foil or foils are laminated together with the layer or layers of woven material under the use of heating and pressurising,

characterised in that the composite material subsequently is cooled in a fully or partly fixed state.

2. A method according to claim 1, characterised in that the cooling is carried out over a period of time of approximately 0.1 to 240 seconds from a temperature of 300 to 420 °C, preferably 20 to 120 seconds from a temperature of 380 to 400 °C to a temperature of about 50 °C.

3. A method according to claim 1 or 2, characterised in that the composite material is subject to a tension during the cooling.

4. A method according to claims 1-3, characterised in that the composite material undergoes a combined cooling and pressure operation by means for pressure application.

5. A method according to claims 1-4, characterised in that the means for pressure supply is provided with cooling means.

Article 34 Amdt

6. A method according to claims 1-5, characterised in that the pressure supply is provided continuously by means for pressure supply comprising at least one roller.

7. A method according to claims 1-5, characterised in that the pressure supply is provided intermittently by means for pressure supply comprising a pressure surface.

8. A method according to claims 1-7, characterised in that the composite material is cooled under a substantively uniform pressure over the surface by a cooling surface.

9. A composite product manufactured according to the claims 1-8, characterised in that the product comprises at least one foil layer of PTFE or ePTFE foil and at least one layer of reinforcing woven material.

10. A composite product according to claim 9, characterised in that the reinforcing woven material consists at least partly of glass fibre fabric or PTFE coated glass fibre fabric.

11. An apparatus for manufacture of a composite material comprising at least one layer of reinforcing woven material and at least one layer of PTFE foil or ePTFE foil, where the foil or foils are laminated together with the layer or layers of woven material under the use of heating and pressurising, as the apparatus comprises means for lamination of the composite material by a combined pressure and heat supply,

c h a r a c t e r i s e d i n t h a t the apparatus further comprises means for fixation of the uncooled or at least only partly cooled composite material and with said means co-operating controllable cooling means.

12. An apparatus according to claim 11, c h a r a c t e r i s e d i n t h a t the means of the apparatus for fixation and the associated controllable cooling means comprises at least one pressure surface including integrated cooling means.

13. An apparatus according to claim 11, c h a r a c t e r i s e d i n t h a t the means of the apparatus for fixation and the associated controllable cooling means comprises at least one roller having integrated cooling means.

ABSTRACT

The invention relates to a method of manufacture of a composite product comprising at least one layer of reinforced woven material and at least one layer of PTFE foil or ePTFE foil, where the foil or foils are laminated together with the layer or layers of woven material under the use of heating and pressurising, where the composite material subsequently is cooled to a fully or partly fixed state. According to a preferred embodiment the composite is fixated by means of one or two co-operating pressure surfaces under a relative high pressure. By the invention a form stabile composite material having a considerable enhanced E-module is achieved.

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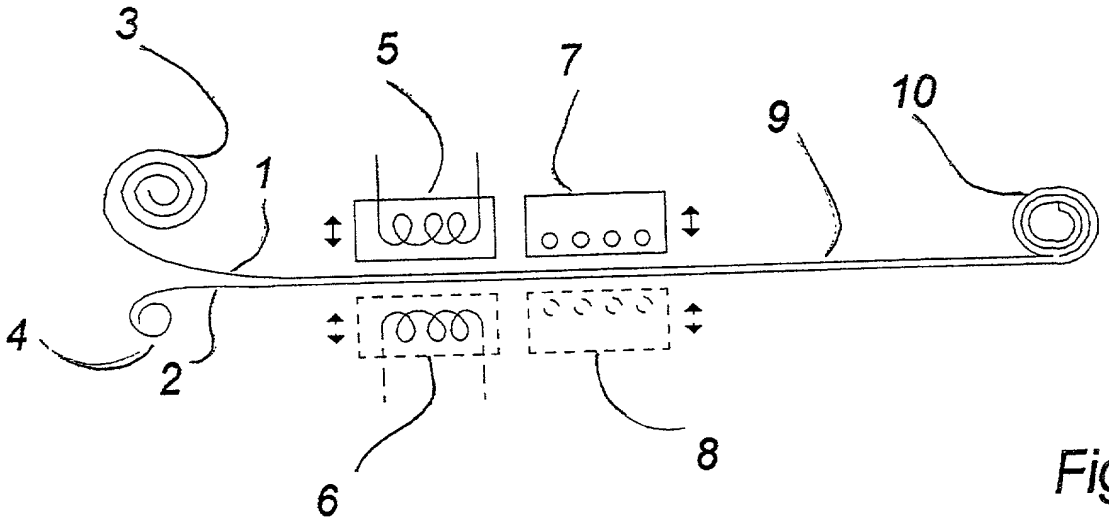

Fig.1

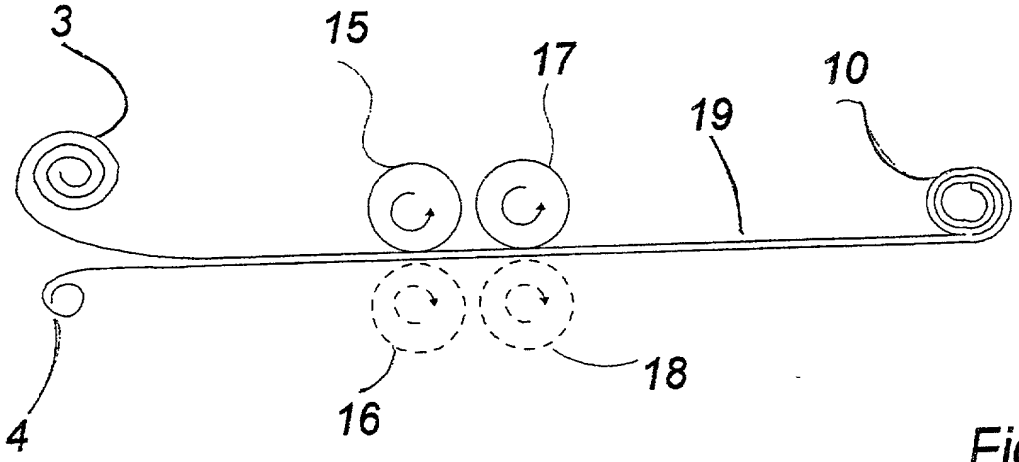

Fig.2

For Utility, PCT, and Design Applications

▼ INSTRUCTIONS

MERCHANT & GOULD

United States Patent Application

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that

I verily believe I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Insert TITLE of invention

Method of manufacturing a composite material

Check a or b

The specification of which

a. ☐ is attached hereto

b. ☐ was filed on _____

If "b" checked, complete

as application serial no. _____

and was amended on _____ (if applicable)

If PCT Application

(in the case of PCT-filed application)

Insert Int. application number & filing date

described and claimed in international no. PCT/DK98/00342 filed 6 August 1998

and as amended on 6 August 1999 (if any), which I have reviewed and for which I solicit a United States patent.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations,§ 1.56(a). (Reprinted on back side).

I hereby claim foreign priority benefits under Title 35, United States Code, §119/365 of any foreign application(s) for patent of inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on the basis of which priority is claimed:

Prior applications Check a or b

a. ☐ no such applications havebeen filed.

b. ☐ such applications have been filed as follows:

If "b" checked, complete

FOREIGN APPLICATION(S), IF ANY, CLAIMING PRIORITY UNDER 35 USC § 119			
COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)
Denmark	910/97	6 August 1997	
ALL FOREIGN APPLICATION(S), IF ANY, FILED BEFORE THE PRIORITY APPLICATION(S)			
COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)

I hereby claim the benefit under Title 35, United States Code,§ 120/365 of any United States and PCT international application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code§ 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations§ 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

For Continuation-in-Part (CIP) Applications, complete

U.S. APPLICATION NUMBER	DATE OF FILING (day, month, year)	STATUS (patented, pending, abandoned)

Revised 1/8/99

I hereby appoint the following attorney(s) and/or patent agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith:

Albrecht, John W.	Reg. No. 40,481	Gorman, Alan G.	Reg. No. 38,472	Pauly, Daniel M.	Reg. No. 40,123
Anderson, Gregg I.	Reg. No. 28,828	Gould, John D.	Reg. No. 18,223	Plunkett, Theodore	Reg. No. 37,209
Ansems, Gregory M.	Reg. No. 42,264	Gregson, Richard	Reg. No. 41,804	Pytel, Melissa J.	Reg. No. 37,209
Batzli, Brian H.	Reg. No. 32,960	~~Gresens, John J.~~	Reg. No. 33,112	Reich, John C.	Reg. No. 37,703
Beard, John L.	Reg. No. 27,612	Hamre, Curtis B.	Reg. No. 29,165	Reiland, Earl D.	Reg. No. 25,767
Berman, Charles	Reg. No. 29,249	Hillson, Randall A.	Reg. No. 31,838	Rittmaster, Ted R.	Reg. No. 32,933
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Blasdell, Thomas L.	Reg. No. 31,329	Kastelic, Joseph M.	Reg. No. 37,160	Schuman, Mark D.	Reg. No. 31,197
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Byrne, Linda M.	Reg. No. 32,404	Komanduri, Janaki	Reg. No. 40,684	Skoog, Mark T.	Reg. No. 40,178
Carlson, Alan G.	Reg. No. 25,959	Kowalchyk, Alan W.	Reg. No. 31,535	Soderberg, Richard	Reg. No. P-43,352
Carter, Charles G.	Reg. No. 35,093	Kowalchyk, Katherine M.	Reg. No. 36,848	Sumner, John P.	Reg. No. 29,114
Caspers, Philip P.	Reg. No. 33,227	Kubota, Glenn M.	Reg. No. P-44,197	Sumners, John S.	Reg. No. 24,216
Chiapetta, James R.	Reg. No. 39,634	Lacy, Paul A.	Reg. No. 38,946	Tellekson, David K.	Reg. No. 32,314
Clifford, John A.	Reg. No. 30,247	Larson, James A.	Reg. No. 40,443	Trembath, Jon R.	Reg. No. 38,344
Cochran, William W.	Reg. No. 26,652	Lasky, Michael B.	Reg. No. 29,555	Underhill, Albert L.	Reg. No. 27,403
Daignault, Ronald A.	Reg. No. 25,968	Liepa, Mara E.	Reg. No. 40,066	Vandenburgh, J. Derek	Reg. No. 32,179
Daley, Dennis R.	Reg. No. 34,994	Lindquist, Timothy A.	Reg. No. 40,701	Vrandenburgh, Anna M.	Reg. No. 39,868
Dalglish, Leslie E.	Reg. No. 40,579	Lynch, David W.	Reg. No. 36,204	Welter, Paul A.	Reg. No. 20,890
Daulton, Julie R.	Reg. No. 36,414	Marschang, Diane L.	Reg. No. 35,600	Whipps, Brian	Reg. No. P-43,261
DeVries Smith, Kate	Reg. No. 42,157	McDaniel, Karen D.	Reg. No. 37,674	Wickhem, J. Scot	Reg. No. 41,376
DiPietro, Mark J.	Reg. No. 28,707	McDonald, Daniel W.	Reg. No. 32,044	Williams, Douglas J.	Reg. No. 27,054
Edell, Robert T.	Reg. No. 20,187	McIntyre, Iain A.	Reg. No. 40,377	Witt, Jonelle	Reg. No. 41,980
Epp Ryan, Sandra	Reg. No. 39,667	McKenzie, Denise L.	Reg. No. P-43,790	Wood, Gregory B.	Reg. No. 28,133
Farber, Michael B.	Reg. No. 32,612	Mueller, Douglas P.	Reg. No. 30,300	Wood, William	Reg. P-42,236
Funk, Steven R.	Reg. No. 37,830	Nasiedlak, Tyler L.	Reg. No. 40,099	Xu, Min S.	Reg. No. 39,536
Glance, Robert J.	Reg. No. 40,529	Nelson, Albin J.	Reg. No. 28,650		
Golla, Charles E.	Reg. No. 26,896	Parker, Sandra M.	Reg. No. 36,233		

85 –

I hereby authorize them to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/organization/who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct Merchant & Gould to the contrary.

Please direct all correspondence in this case to Merchant, Gould, Smith, Edell, Welter & Schmidt at the address indicated below (or if no address is specified, the first address):

☒ 3100 Norwest Center, 90 South Seventh Street; Minneapolis, MN 55402-4131 (Telephone No. (612) 332-5300)

☐ Independence Plaza, Suite 1400; 1050 17th St.; Denver, CO 80265-0100 (Telephone No. (303) 357-1670)

☐ Westwood Gateway II, Suite 400; 11150 Santa Monica Boulevard; Los Angeles, CA 90025-3395 (Telephone No. (310) 445-1140)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Insert FULL name(s) AND address(es) of actual inventor(s)

1-00

201	FULL NAME OF INVENTOR	FAMILY NAME: Mathiesen	FIRST GIVEN NAME: Benny	SECOND GIVEN NAME: Martin
	RESIDENCE & CITIZENSHIP	CITY: Middelfart	STATE OR FOREIGN COUNTRY: Denmark DKX	COUNTRY OF CITIZENSHIP: Denmark
	POST OFFICE ADDRESS	POST OFFICE ADDRESS: Gl. Strandvej 1	CITY: Middelfart	STATE & ZIP CODE/COUNTRY: 5500 - Denmark
202	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
203	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY

Each inventor must sign & date

Note: No legalization or other witness required

Revised 1/8/99

SIGNATURE OF INVENTOR 201	SIGNATURE OF INVENTOR 202	SIGNATURE OF INVENTOR 203
DATE: Dec 99.	DATE	DATE

For Additional Inventors: ☐ Check box and attach sheet with same information, including date and signature.

§ 1.56 Duty to disclose information material to patentability.

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is cancelled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is cancelled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

(1) prior art cited in search reports of a foreign patent office in a counterpart application, and

(2) the closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and

(1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim;
or

(2) It refutes, or is inconsistent with, a position the applicant takes in:

(i) Opposing an argument of unpatentability relied on by the Office, or

(ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

(1) Each inventor named in the application:

(2) Each attorney or agent who prepares or prosecutes the application; and

(3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

(d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.